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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR  
OF LIMITED DISTRIBUTION, NO. 23: WHITE GARDEN SNAIL

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Class: Gastropoda

Order: Family Stylommatophora: Helicidae

Pest WHITE GARDEN SNAIL  
Theba pisana (Muller)

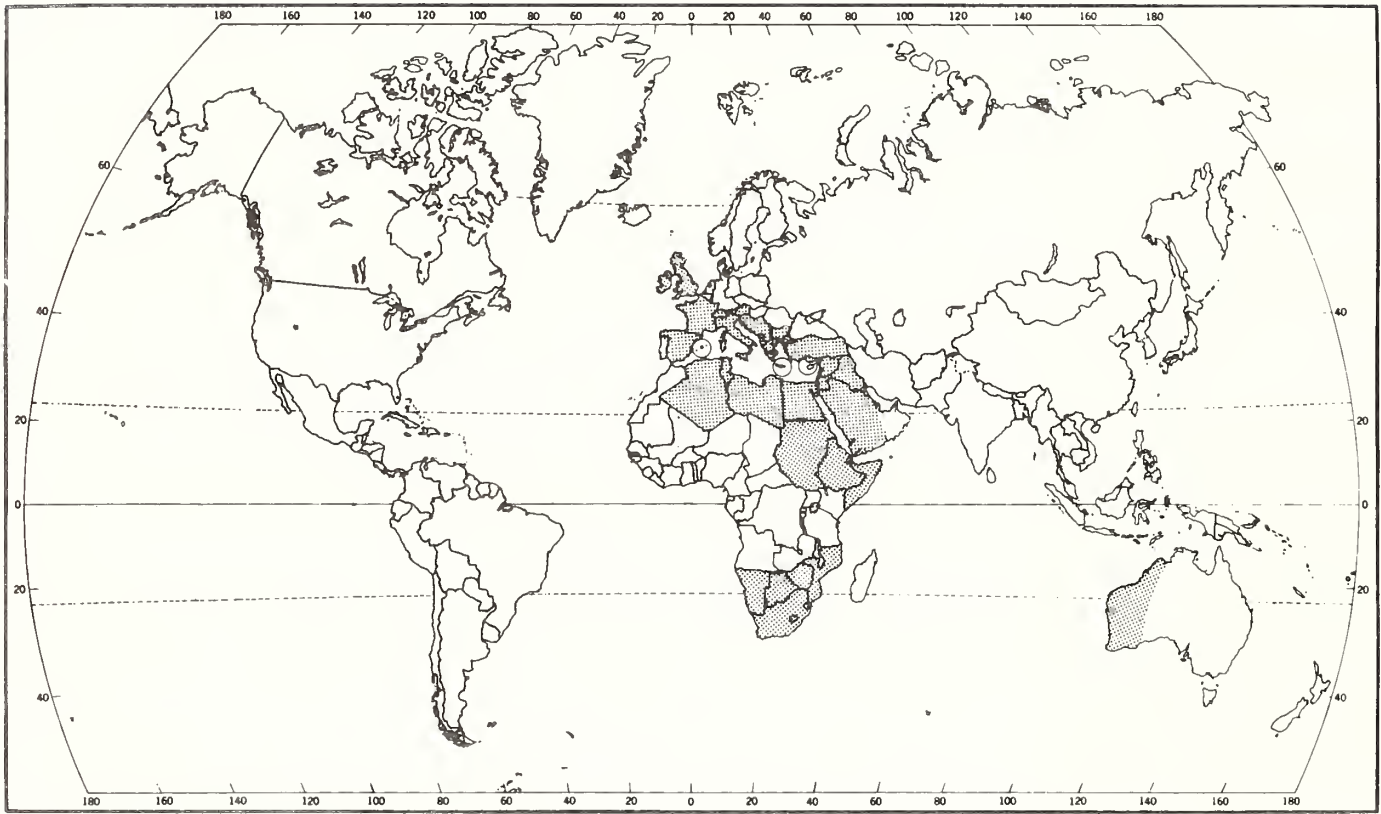
Economic Theba pisana is well adapted as an agricultural pest to  
Importance arid regions. In Israel, this species causes severe  
damage to ornamental plants, vegetables, and citrus trees  
along the Mediterranean coastal plain (Avidov and Harpaz  
1969).

This species is of great concern to agriculture because of  
its high reproductive capacity. Crops and gardens suffer  
tremendous losses from large populations of this snail.

In Europe, this species is recognized as an extremely  
injurious garden pest; a citrus pest, feeding on foliage,  
bark, twigs, fruits, and blossoms; and has also been  
reported as severely damaging olive and almond trees.  
Reports show this destructive snail is constantly  
intercepted at ports of entry.

General This species, a native of Sicily, is distributed in all  
Distribution the countries of the Mediterranean area (Albania, Algeria,  
Cyprus, Egypt, Ethiopia, France, Greece, Iraq, Israel,  
Italy, Jordan, Lebanon, Libya, Saudi Arabia, Spain, Sudan,  
Syria, Tunisia, Turkey, Yemen, Yugoslavia), Somalia,  
Switzerland, and United Kingdom (Western England and  
Wales). It has also been introduced into Western  
Australia, and the southern area of Africa (Botswana,  
Mozambique, Namibia, South Africa, Zimbabwe). Several  
infestations of the white garden snail have been  
eradicated from California. The first detection in  
California was made at La Jolla in 1918.

Hosts This pest has been known to feed on the living foliage of  
many garden plants and weeds, also as a scavenger on  
organic matter. It is a particular problem of Citrus spp.  
(Paddock 1978).



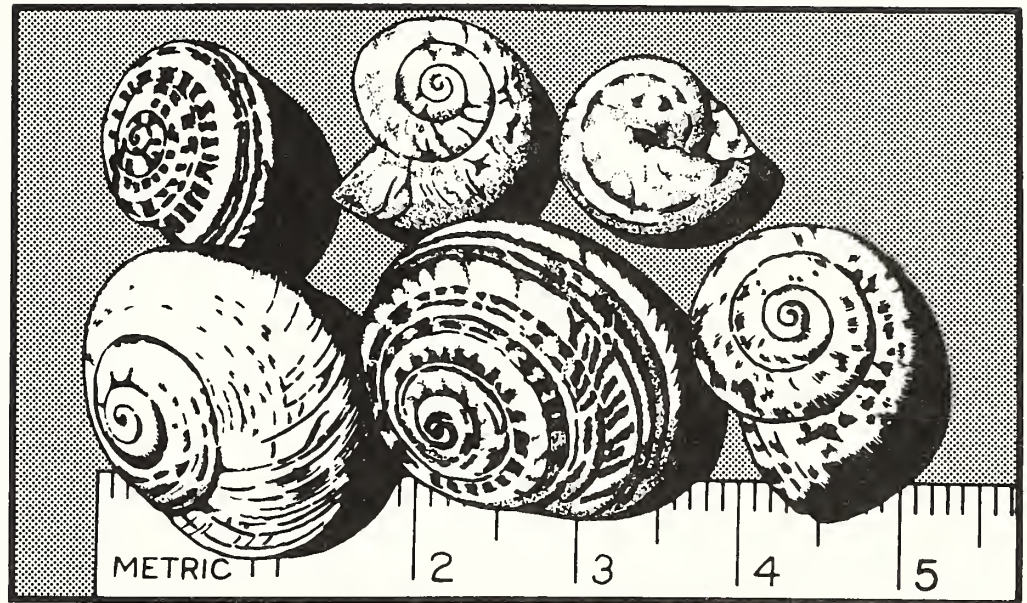
Theba pisana map prepared by USDA, APHIS, PPQ, Biological Assessment Support Staff

## Characters

ADULTS - Shell ivory yellow, nonglossy surface. Distinct band pattern with unequal brown bands represented by dots (fig. A). Adult shell opaque, width about 22 mm, height 15 mm, 4.5 whorls. Fine spiral striae (raised or impressed lines) sculpture the whorls. There is a wide variation from the type described above, ranging from plain white shells with no stripes, to those with as many as 14 lineal stripes (see fig. A).

At La Jolla, in a collection of 1,093 specimens, 6 1/2 percent were plain white or buff, 10 percent were strongly striped, and 83 1/2 percent ranged from the faintest marking to those with medium strong striping. Size of the shells of various ages ranged from 3-19 mm and the largest specimens found at La Jolla measured 24 cm across the widest diameter. The shell has a minute opening at the base. The aperture is shaped like a half moon. The lip is sharp, often ringed inside with a callus or thickening (Basinger 1927, Dees 1970).

(Fig. A)



Shells of Theba pisana showing variation in pattern (drawing after Paddock 1978).

Body color varies from light cream to dark gray, length 5 cm or more when fully matured. Anterior end with two pairs of tentacles which serve as the sight and smell organs. The foot on the underside of the body secretes mucus and provides locomotion. The mouth has fleshy lips, backed by a hard chitinous plate which has a sharp-toothed edge used as a rasp or scraper during feeding and the radula which guides food into the digestive tract. See fig. B for typical helicid external features and internal structures.

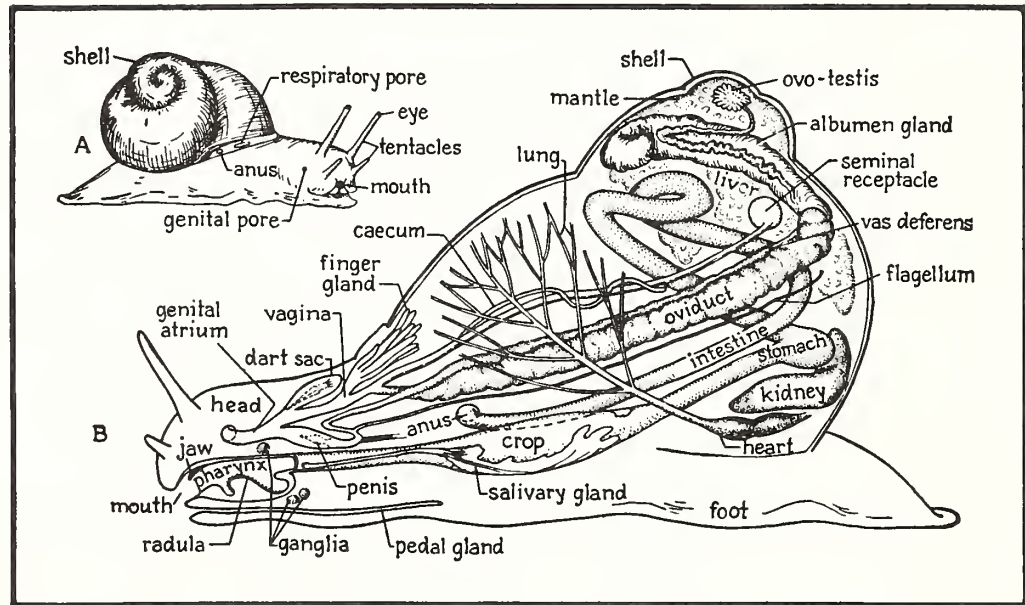
EGGS - Similar to typical snail eggs. White, turgid, 3-4 mm. Eggs deposited several cm into soil in a gelatinous mass from 1-4 days after fertilization, following the first fall rains.

Characteristic  
Damage

Food is held by the jaw and rasped off by movements of the radula. Garden and field plants and even trees are severely damaged by the consumption of the green vegetation and other parts. This snail feeds on citrus leaves and tender bark, especially of young trees.



(Fig. B)



Typical external features (A) and internal structures (B) of Helicidae. From General Zoology. 2d ed. by Storer, T. I. Copyright © 1951 McGraw-Hill. Used by permission of McGraw-Hill Book Company.

Detection  
Notes

1. White to ivory-yellow snails are suspect. Submit shells for identification.
2. Look for clusters of suspect snails on sides of buildings, fences, rocks, etc. Submit for identification.
3. Look for active snails in moist weather or in areas subjected to sprinkling practices.
4. Look for epiphragms (the parchmentlike substitutes for opercula, see biology) remaining where snails have aestivated and then moved on with return of moist weather.
5. Since some color variants of the European brown snail can resemble the white garden snail, suspect subjects should be submitted for determination.
6. Preservation of snail specimens can be done by extracting the soft parts and keeping the shell dry, since identification is ordinarily done by the shells alone. This extraction is done by boiling for up to 5 minutes in fresh water, depending on size, to facilitate removal.

If the soft parts of the snails are to be preserved, the method described for preserving slugs works well. Specimens are drowned in a 1 percent solution of sugar, especially sorbitol, with chloral hydrate or a few crystals of thymol as an anesthetic. Permanent preservation is in 75 percent ethyl alcohol, never in a formaldehyde solution which destroys the shells (Paddock 1978, Hanna 1966).

## Biology

Theba pisana is hermaphroditic, but mutual fertilization is necessary for reproduction. Mating begins in the fall when the first rains come, but may also be induced by artificial watering. Oviposition after mating can occur in 1-4 days, but this time might greatly extend, e.g. 3 weeks as happened at La Jolla, if dry weather occurs after mating time. Egg laying continues throughout the rainy season but each snail lays only one egg mass per season.

The snail finds a suitable place where the soil is moist and begins to dig. The shell is upright, aperture to the ground and only the tip of the foot sticking out. A round hole is dug down to about 40 mm and the lower half is enlarged to form a cavity for the egg mass. The dirt, dug loose by the lips and jaw, is pushed out by the under surface of the foot in an endless ribbonlike stream. A little conical pile is formed at the tip of the foot which is sticking out on one side of the shell. The snail does not withdraw from the hole until the entire process of digging the hole and laying eggs is finished.

The genital aperture is located at the anterior end near the right ocular tentacle (see fig. B). The eggs are laid singly, but as they emerge from the genital aperture they adhere to each other, forming a single mass that looks much like a white blackberry. When all of the eggs are laid, the snail plugs the top of the hole with a mixture of mucus and particles of dirt, then crawls away. The closing of the hole is very inconspicuous and the only evidence that remains is a pile of earth about 13 mm high and 26 mm in diameter. The number of eggs varies greatly; at La Jolla 52-226 eggs in each nest averaged a little over 120.

The time of incubation varies according to moisture and temperature. This period was 12-16 days in Italy and 20-30 days at La Jolla in April 1919 and 20-21 days in December 1922. The shell of the newly hatched T. pisana is about 2 mm in diameter and has one and one-half whorls.

Feeding soon starts on tender plants nearby, and the young snail increases its shell size. At La Jolla, snails ranged 5-11 mm 14 weeks after hatching. Shell growth is very rapid during wet weather and the shells cannot be picked up without crushing them. Growth occurs almost entirely during periods of moist or wet weather. Activity is not entirely dependent on rain as there is some movement during foggy weather when there is a heavy dew.

The young do not wander far for at least several months. The older individuals wander farthest, only these are found some distance from the general infestation. Their habit of sticking on a great many different kinds of surfaces gives them an aid in dispersion, through the transportation of plants and other articles.

Because there was, as is usual, a season of more or less continuous favorable weather for several months during the winter at La Jolla, a uniform shell growth of some extent was made, but for the rest of the year only occasional short periods for growth occurred, the intervening periods being spent in aestivation. This resulted in a narrow, rough band alternating with the broader uniform band of the winter's growth. These growth rings were very plain on some shells. Some showed as high as 4 winter seasons' growth and those of 2 or 3 seasons were common.

The food of T. pisana consists mostly of foliage but the species also feeds on other things. The pulp from weathered wood or paper is often eaten. Soil is commonly taken into the digestive tract.

One of T. pisana's most noticeable habits is climbing up on objects such as sticks, trees, grass, shrubs, and buildings in great masses and sealing itself fast during the summer season. On the ground snails are always under plants, stones, or boards, never on bare, exposed ground. In the rainy season they are scattered on the plants upon which they are feeding.

There is no operculum for closing the aperture of the shell as in some species, but an epiphragm is constructed over the opening of the shell. The epiphragm is like heavy parchment and prevents the drying up of the snail while it is inactive. The seal is pushed off and discarded when it renews activity.



Even when tightly sealed up, snails respond readily to stimuli. If several are placed in a vessel or held in the hand, they soon push off the epiphragms and begin crawling about. Many crawl about and feed during a little shower or even fog and dew in the middle of summer.

Natural  
Enemies

Natural enemies cited in Europe include hedgehogs, crows, magpies, owls, carabids, lampyrids, and a carnivorous species of snail that feeds on the young of Theba pisana (Basinger 1927).

Selected  
References

Avidov, Z.; Harpaz, I. Plant pests of Israel. Jerusalem: Israel University Press; 1969.

Basinger, A. J. The eradication campaign against the white snail (Helix pisana) at La Jolla, California. CA Dept. Agri. Mon. Bull. 16(2):51-76; 1927.

Burch, J. B. Some snails and slugs of quarantine significance to the United States. Agricultural Research ARS 82-1. Washington, DC: Agricultural Research Service, U.S. Department of Agriculture; 1960. p. 1, 4, 32.

Dees, L. T. Edible snails in the United States. U.S. Dept. of the Interior resource pub. 91; 1970.

Gammon, E. T. Helicid snails in California. CA Dept. Agri. Bull. 32(3):173-187; 1943.

Hanna, G. D. Exotic mollusca in California. CA Dept. Agri. Bull. 28(5):303; 1939.

\_\_\_\_\_. Introduced mollusks of Western North America. Occasional Paper 48--California Academy of Science. 1966.

Paddock, E. L. White garden snail. California Department of Agriculture, Division of Plant Industry, D.T. 3:64 (Rev.); 1978.

Storer, T. I. General zoology. 2d ed. New York: McGraw-Hill Book Company, Inc.; 1951.

